

131,072-word × 9-bit High Speed CMOS Static RAM

Description

The CXK591000TM/YM/M is a high speed CMOS static RAM organized as 131,072-words by 9 bits.

A polysilicon TFT cell technology realized extremely low stand-by current and higher data retention stability.

Special feature are low power consumption and high speed.

The CXK591000TM/YM/M is a suitable RAM for portable equipment with battery back up and parity bit.

Features

- Fast access time

CXK591000TM/YM/M	(Access time)
-55LL	55ns (Max.)
-70LL	70ns (Max.)
-10LL	100ns (Max.)

- Low standby current

CXK591000TM/YM/M	
-55LL/70LL/10LL	24µA (Max.)

- Low data retention current

CXK591000TM/YM/M	
-55LL/70LL/10LL	14µA (Max.)

- Single +5V supply: 5V ± 10%.

- Low voltage data retention: 2.0V (Min.)

- Broad package line-up

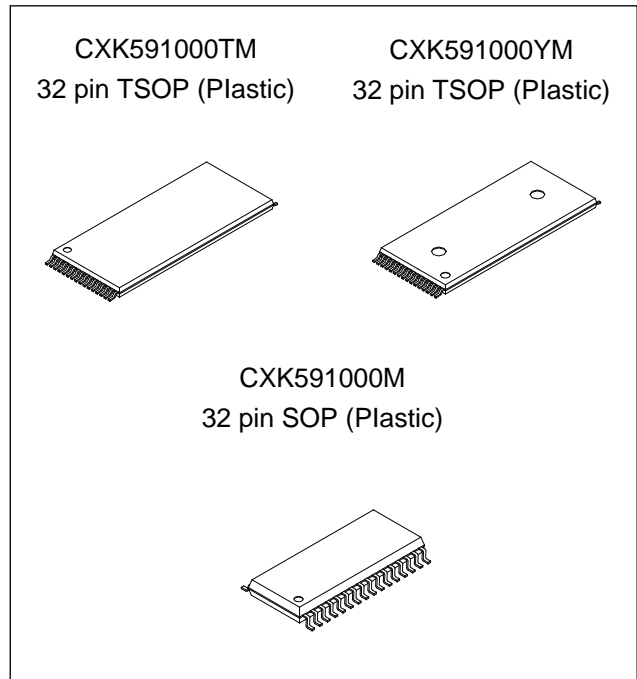
CXK591000TM/YM	8mm × 20mm 32 pin TSOP Package
CXK591000M	525mil 32 pin SOP Package

Function

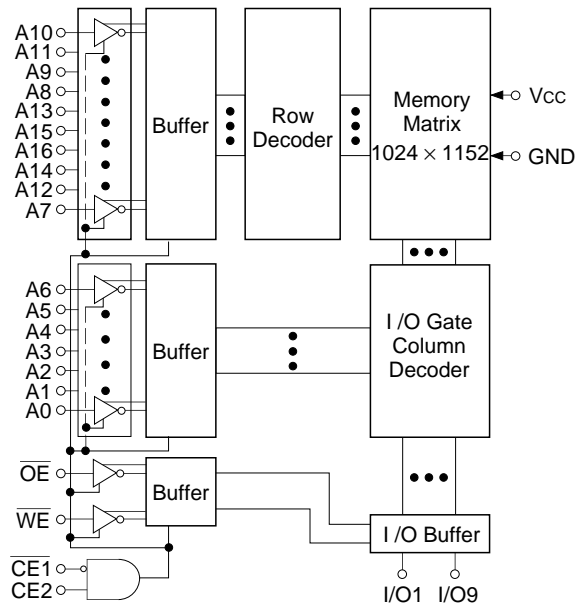
131072 word × 9 bit static RAM

Structure

Silicon gate CMOS IC

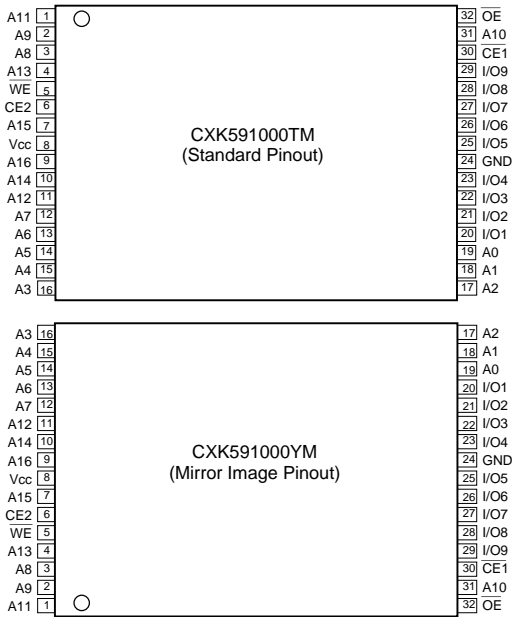


Block Diagram



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Pin Configuration (Top View)



Pin Description

Symbol	Description
A0 to A16	Address input
I/O1 to I/O9	Data input/output
CE1, CE2	Chip enable 1, 2 input
WE	Write enable input
OE	Output enable input
Vcc	Power supply
GND	Ground

Absolute Maximum Ratings

(Ta = 25°C, GND = 0V)

Item	Symbol	Rating	Unit
Supply voltage	Vcc	-0.5 to +7.0	V
Input voltage	V _{IN}	-0.5* to Vcc + 0.5	V
Input and output voltage	V _{I/O}	-0.5* to Vcc + 0.5	V
Allowable power dissipation	P _D	0.7	W
Operating temperature	T _{opr}	0 to +70	°C
Storage temperature	T _{stg}	-55 to +150	°C
Soldering temperature · time	T _{solder}	235 · 10	°C · s

* V_{IN}, V_{I/O} = -3.0V Min. for pulse width less than 50ns.

Truth Table

CE1	CE2	OE	WE	Mode	I/O pin	Vcc Current
H	×	×	×	Not selected	High Z	IsB1, IsB2
×	L	×	×	Not selected	High Z	IsB1, IsB2
L	H	H	H	Output disable	High Z	Icc1, Icc2, Icc3
L	H	L	H	Read	Data out	Icc1, Icc2, Icc3
L	H	×	L	Write	Data in	Icc1, Icc2, Icc3

×: "H" or "L"

DC Recommended Operating Conditions (Ta = 0 to +70°C, GND = 0V)

Item	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V _{CC}	4.5	5.0	5.5	V
Input high voltage	V _{IH}	2.2	—	V _{CC} + 0.3	V
Input low voltage	V _{IL}	-0.3*	—	0.8	V

* V_{IL} = -3.0V Min. for pulse width less than 50ns.

Electrical Characteristics

• **DC Characteristics**

(V_{CC} = 5V ± 10%, GND = 0V, Ta = 0 to +70°C)

Item	System	Test conditions	Min.	Typ.*	Max.	Unit	
Input leakage current	I _{LI}	V _{IN} = GND to V _{CC}	-1	—	+1	μA	
Output leakage current	I _{LO}	$\overline{CE1} = V_{IH}$ or $CE2 = V_{IL}$ or $\overline{OE} = V_{IH}$ or $\overline{WE} = V_{IL}$ V _{I/O} = GND to V _{CC}	-1	—	+1	μA	
Operating power supply current	I _{CC1}	$\overline{CE1} = V_{IL}$, CE2 = V _{IH} V _{IN} = V _{IH} or V _{IL} I _{OUT} = 0mA	—	8	17	mA	
Average operating current	I _{CC2}	Min. cycle duty = 100% I _{OUT} = 0mA	-55LL	—	50	100	mA
			-70LL	—	45	80	
			-10LL	—	40	70	
Standby current	I _{SB1}	CE2 ≤ 0.2V CE1 ≥ V _{CC} - 0.2V CE2 ≥ V _{CC} - 0.2V	0 to +70°C	—	—	24	μA
			0 to +40°C	—	—	5	
			+25°C	—	0.8	2.4	
	I _{SB2}	$\overline{CE1} = V_{IH}$ or CE2 = V _{IL}	—	0.6	3	mA	
Output high voltage	V _{OH}	I _{OH} = -1.0mA	2.4	—	—	V	
Output low voltage	V _{OL}	I _{OL} = 2.1mA	—	—	0.4	V	

* V_{CC} = 5V, Ta = 25°C

I/O capacitance

(Ta = 25°C, f = 1MHz)

Item	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Input capacitance	C _{IN}	V _{IN} = 0V	—	—	7	pF
I/O capacitance	C _{I/O}	V _{I/O} = 0V	—	—	8	pF

Note) This parameter is sampled and is not 100% tested.

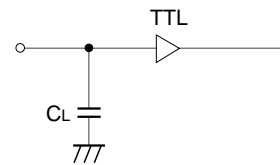
AC Characteristics

• **AC test conditions**

(V_{CC} = 5V ± 10%, Ta = 0 to +70°C)

• **Test circuit**

Item	Conditions	
Input pulse high level	V _{IH} = 2.2V	
Input pulse low level	V _{IL} = 0.8V	
Input rise time	tr = 5ns	
Input fall time	tf = 5ns	
Input and output reference level	1.5V	
Output load conditions	-55LL	C _L * = 30pF, 1TTL
	-70LL/10LL	C _L * = 100pF, 1TTL



* C_L includes scope and jig capacitances.

• Read cycle ($\overline{WE} = "H"$)

Item	Symbol	-55LL		-70LL		-10LL		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
Read cycle time	t_{RC}	55	—	70	—	100	—	ns
Address access time	t_{AA}	—	55	—	70	—	100	ns
Chip enable access time ($\overline{CE1}$)	t_{CO1}	—	55	—	70	—	100	ns
Chip enable access time (CE2)	t_{CO2}	—	55	—	70	—	100	ns
Output enable to output valid	t_{OE}	—	30	—	40	—	50	ns
Output hold from address change	t_{OH}	15	—	15	—	15	—	ns
Chip enable to output in low Z ($\overline{CE1}$, CE2)	t_{LZ1} , t_{LZ2}	10	—	10	—	10	—	ns
Output enable to output in low Z (\overline{OE})	t_{OLZ}	5	—	5	—	5	—	ns
Chip disable to output in high Z ($\overline{CE1}$, CE2)	t_{HZ1} , t_{HZ2}^*	—	25	—	25	—	35	ns
Output disable to output in high Z (\overline{OE})	t_{OHZ}^*	—	25	—	25	—	35	ns

* t_{HZ1} , t_{HZ2} and t_{OHZ} are defined as the time required for outputs to turn to high impedance state and are not referred to as output voltage levels.

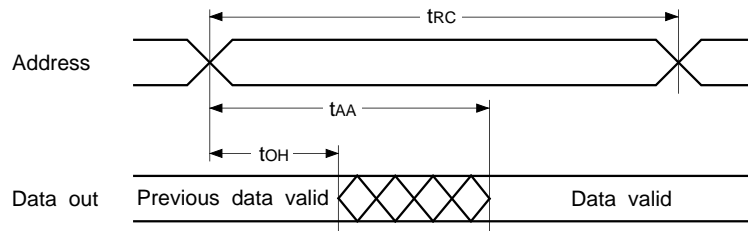
• Write cycle

Item	Symbol	-55LL		-70LL		-10LL		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
Write cycle time	t_{WC}	55	—	70	—	100	—	ns
Address valid to end of write	t_{AW}	50	—	60	—	70	—	ns
Chip enable to end of write	t_{CW}	50	—	60	—	70	—	ns
Data to write time overlap	t_{DW}	25	—	30	—	40	—	ns
Data hold from write time	t_{DH}	0	—	0	—	0	—	ns
Write pulse width	t_{WP}	40	—	50	—	60	—	ns
Address setup time	t_{AS}	0	—	0	—	0	—	ns
Write recovery time (\overline{WE})	t_{WR}	0	—	0	—	0	—	ns
Write recovery time ($\overline{CE1}$, CE2)	t_{WR1}	0	—	0	—	0	—	ns
Output active from end of write	t_{OW}	10	—	10	—	10	—	ns
Write to output in high Z	t_{WHZ}^*	—	25	—	25	—	30	ns

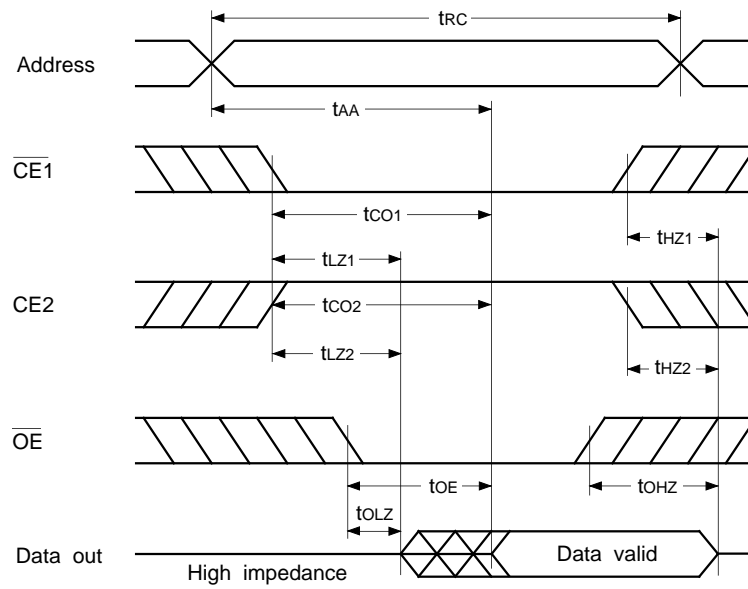
* t_{WHZ} is defined as the time required for outputs to turn to high impedance state and is not referred to as output voltage level.

Timing Waveform

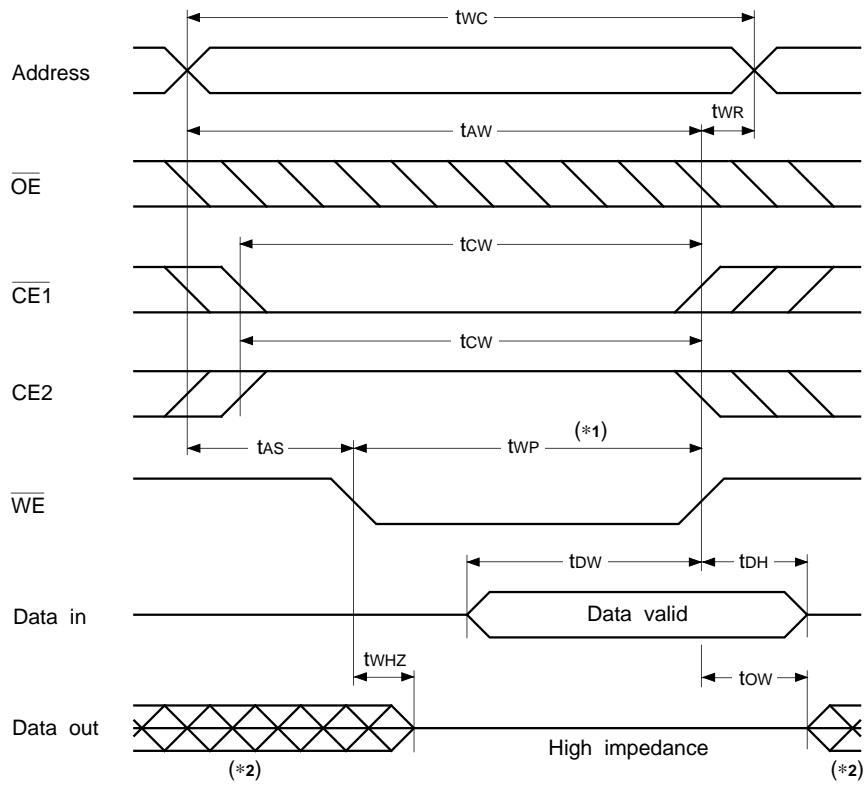
- Read cycle (1) : $\overline{CE1} = \overline{OE} = V_{IL}$, $CE2 = V_{IH}$, $\overline{WE} = V_{IH}$



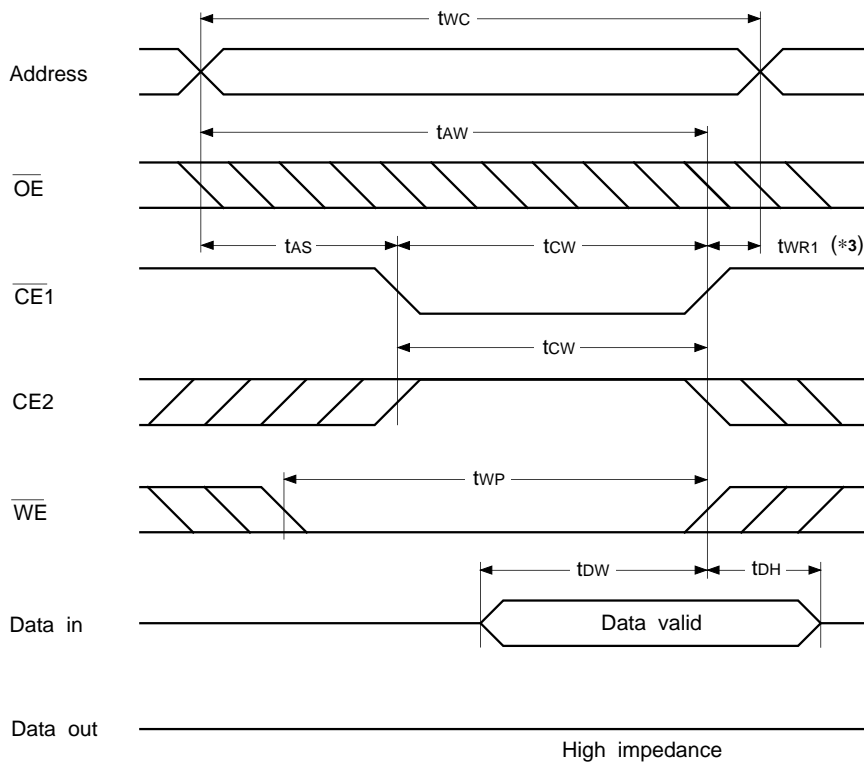
- Read cycle (2) : $\overline{WE} = V_{IH}$



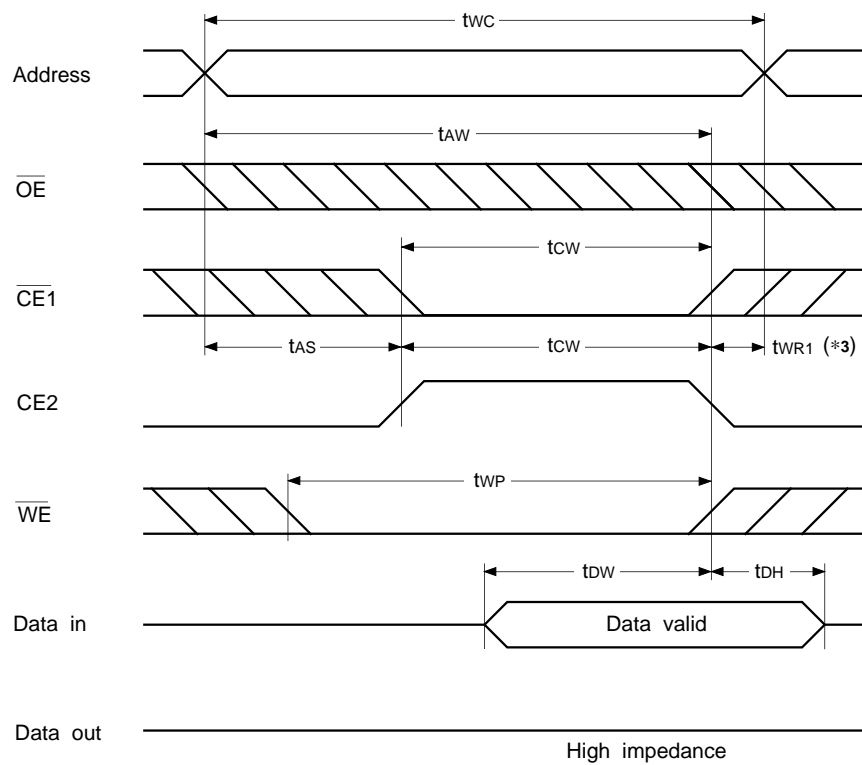
• Write cycle (1) : \overline{WE} control



• Write cycle (2) : $\overline{CE1}$ control



• Write cycle (3) : CE2 control



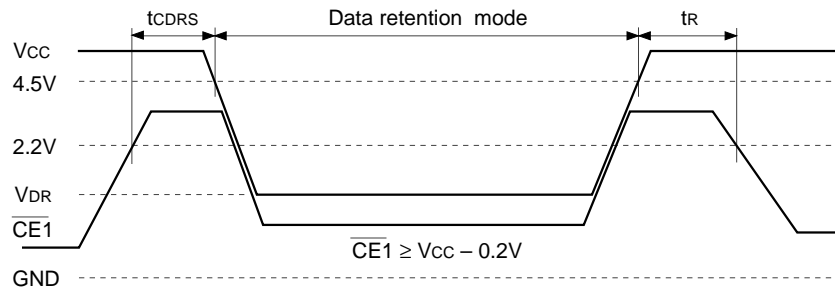
*1 Write is executed when both $\overline{CE1}$ and \overline{WE} are at low and CE2 is at high simultaneously.

*2 Do not apply the data input voltage of the opposite phase to the output while I/O pin is in output condition.

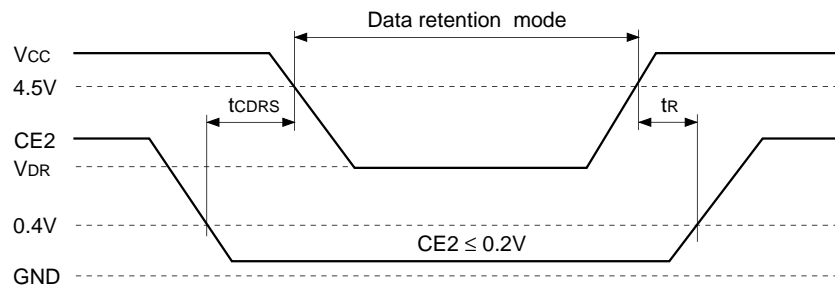
*3 t_{WR1} is tested from either the rising edge of $\overline{CE1}$ or the falling edge of CE2, whichever comes earlier, until the end of the write cycle.

Data retention waveform

- Low supply voltage data retention waveform (1) ($\overline{\text{CE1}}$ control)



- Low supply voltage data retention waveform (2) (CE2 control)



Data Retention Characteristics

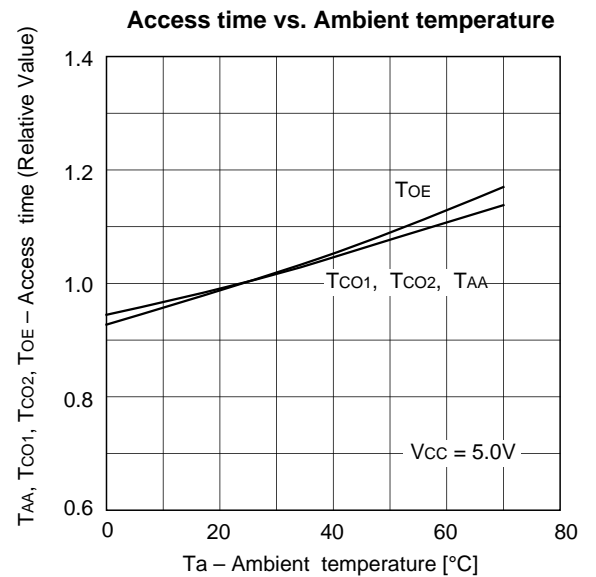
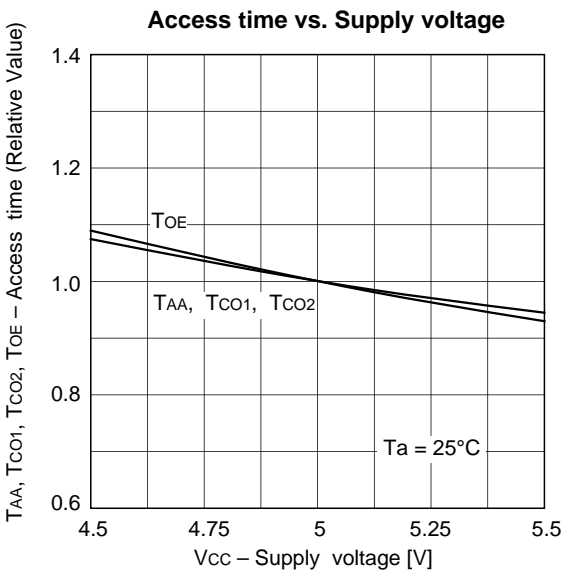
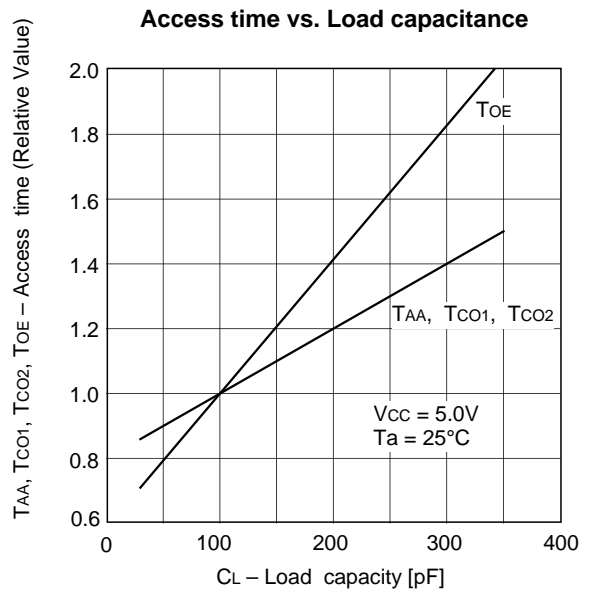
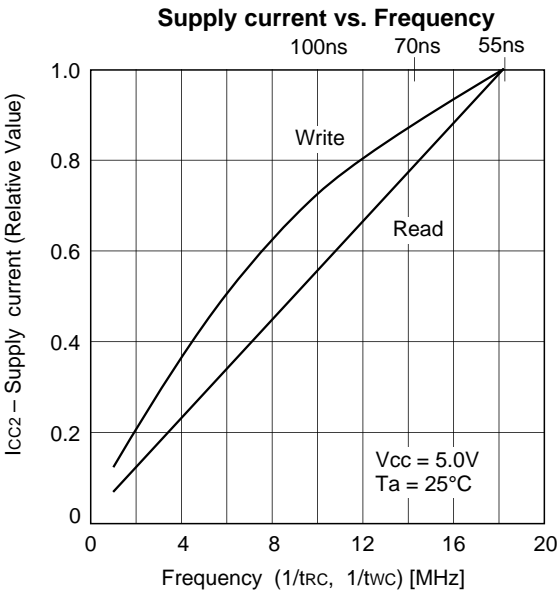
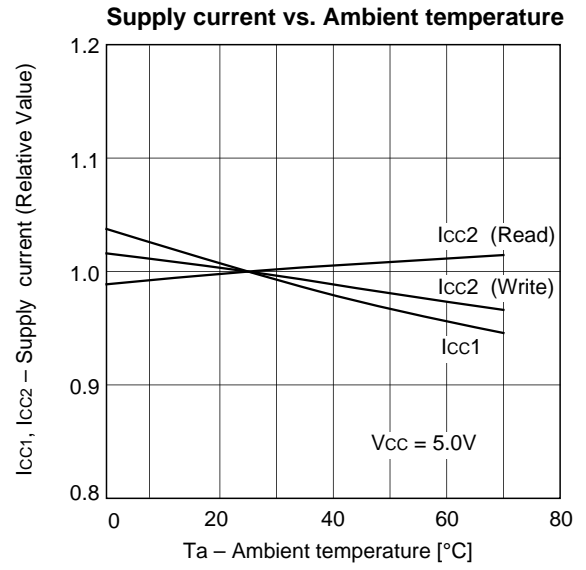
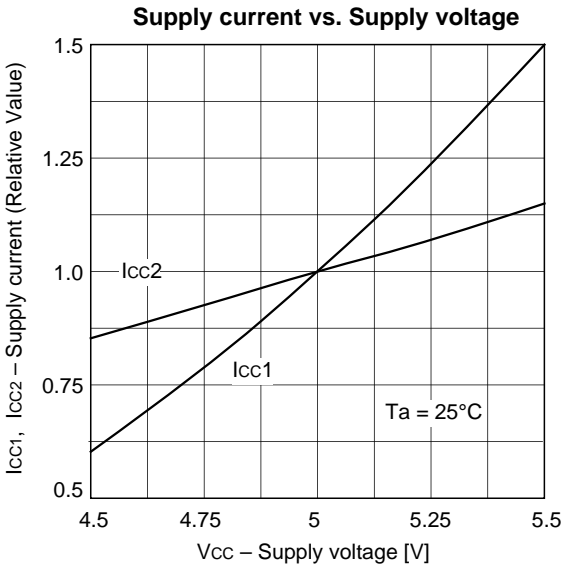
($T_a = 0$ to $+70^\circ\text{C}$)

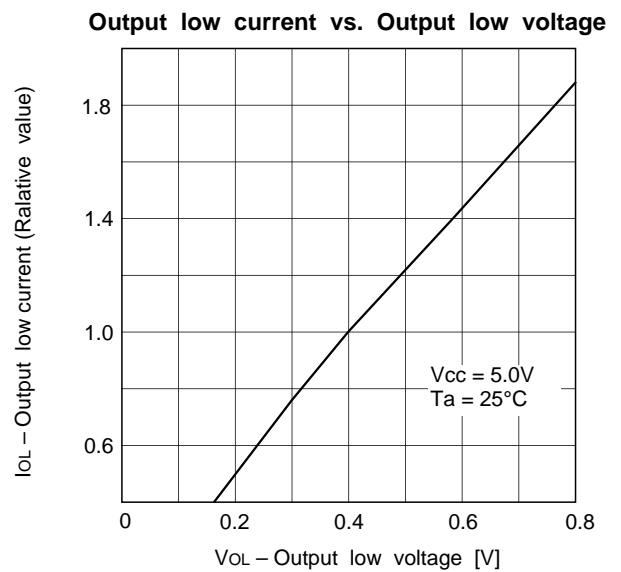
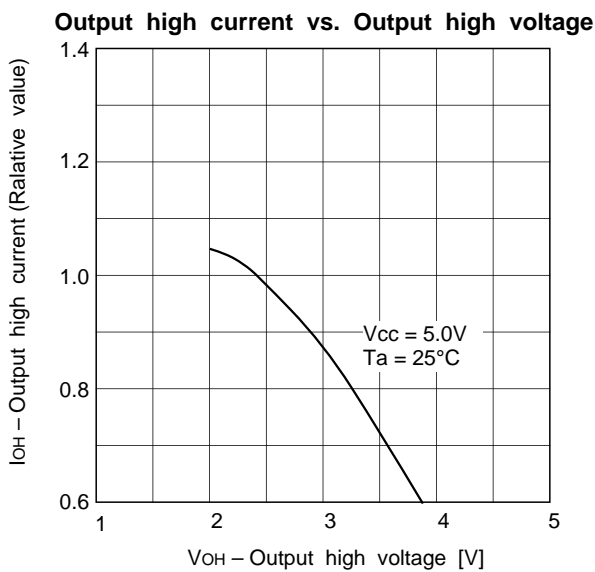
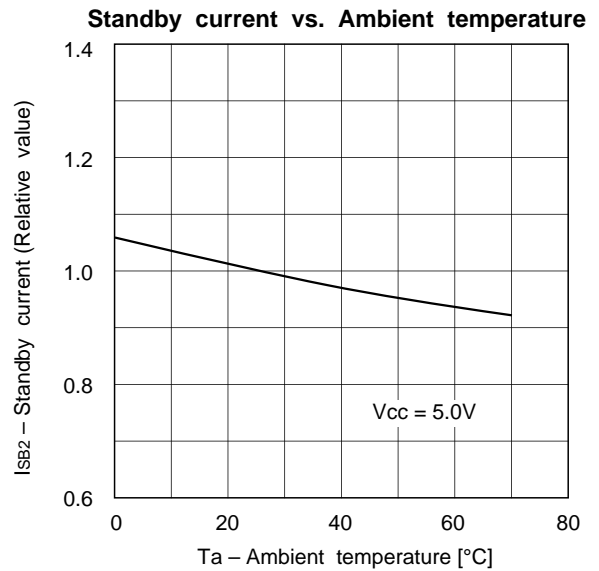
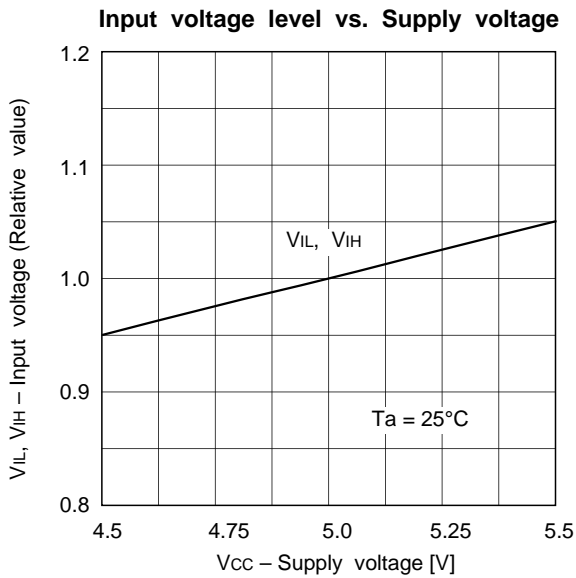
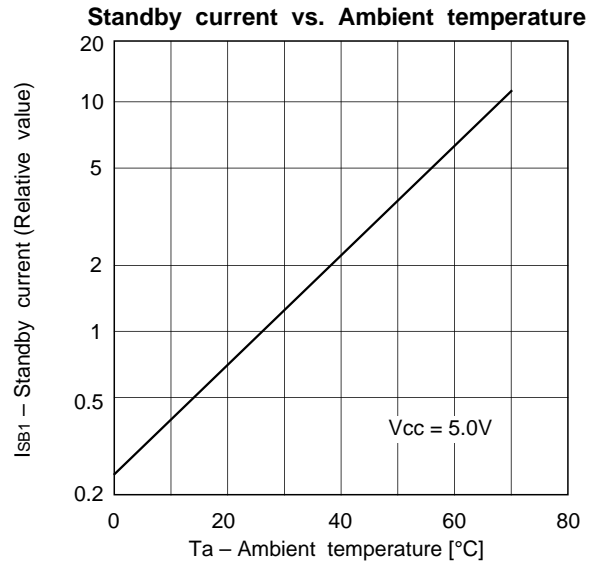
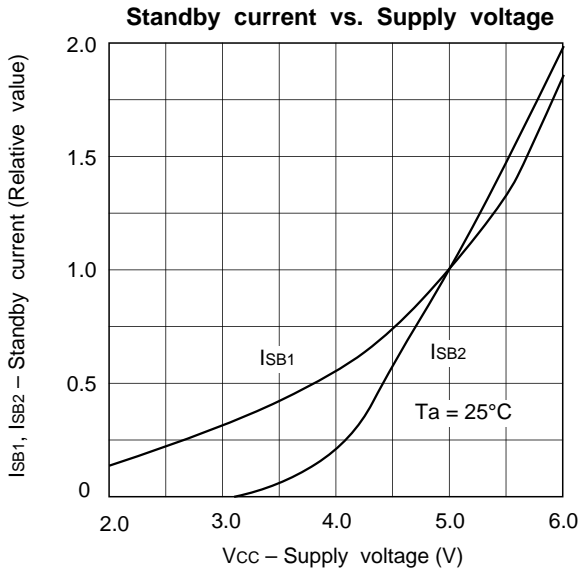
Item	Symbol	Test conditions	Min.	Typ.	Max.	Unit	
Data retention voltage	V_{DR}	*1	2.0	—	5.5	V	
Data retention current	I_{CCDR1}	$V_{CC} = 3.0\text{V}^{*1}$	0 to $+70^\circ\text{C}$	—	—	14	μA
			0 to $+40^\circ\text{C}$	—	—	3	
			$+25^\circ\text{C}$	—	0.5	1.4	
	I_{CCDR2}	$V_{CC} = 2.0$ to 5.5V^{*1}	—	0.8^{*2}	24	μA	
Data retention setup time	t_{CDRS}	Chip disable to data retention mode	0	—	—	ns	
Recovery time	t_R		5	—	—	ms	

*1 $\overline{\text{CE1}} \geq V_{CC} - 0.2\text{V}$, $\text{CE2} \geq V_{CC} - 0.2\text{V}$ ($\overline{\text{CE1}}$ control) or $\text{CE2} \leq 0.2\text{V}$ (CE2 control)

*2 $V_{CC} = 5\text{V}$, $T_a = 25^\circ\text{C}$

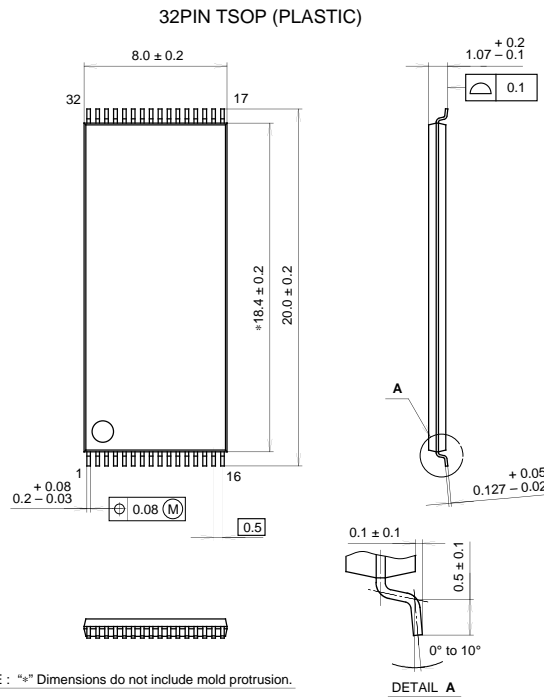
Example of Representative Characteristics





Package Outline Unit: mm

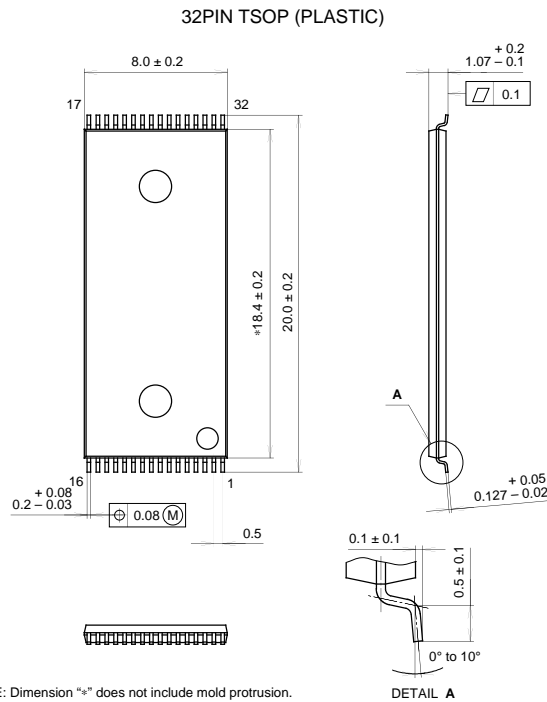
CXK591000TM



PACKAGE STRUCTURE

SONY CODE	TSOP-32P-L01	PACKAGE MATERIAL	EPOXY RESIN
EIAJ CODE	TSOP032-P-0820	LEAD TREATMENT	SOLDER PLATING
JEDEC CODE		LEAD MATERIAL	42 ALLOY
		PACKAGE WEIGHT	0.3g

CXK591000YM

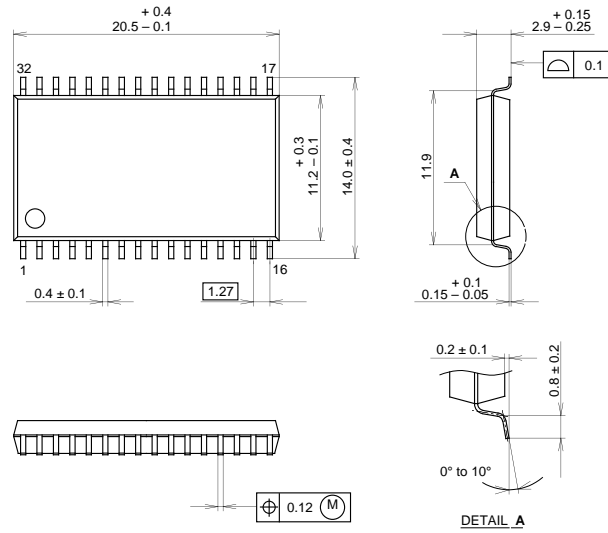


PACKAGE STRUCTURE

SONY CODE	TSOP-32P-L01R	PACKAGE MATERIAL	EPOXY RESIN
EIAJ CODE	TSOP032-P-0820-B	LEAD TREATMENT	SOLDER PLATING
JEDEC CODE		LEAD MATERIAL	42 ALLOY
		PACKAGE WEIGHT	0.3g

CXK591000M

32PIN SOP (PLASTIC)



PACKAGE STRUCTURE

SONY CODE	SOP-32P-L02
EIAJ CODE	SOP032-P-0525
JEDEC CODE	_____

PACKAGE MATERIAL	EPOXY RESIN
LEAD TREATMENT	SOLDER PLATING
LEAD MATERIAL	42 ALLOY
PACKAGE WEIGHT	1.2g